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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.
P.O. BOX 2938
MINNEAPOLIS, MN 55402

EXAMINER	
DANG, THANH HA T	

ART UNIT	PAPER NUMBER
2163	

DATE MAILED: 12/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/087,360	CHA ET AL.	
	Examiner	Art Unit	
	Thanh-Ha Dang	2163	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 September 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) *17-32* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06/03/02* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-16 are rejected in this Office Action.
2. Applicants withdrew Claims 17-32.
3. This Action is made Final.

Response to Amendment

4. Receipt of Applicant's Amendment filed 09/06/2006 is acknowledged.
5. Applicant's amendment submitted on 09/06/2006 does not overcome the rejection in connection with Claim Rejection - 35 U.S.C. 101 concerning claims 1 and 12. Examiner hereby maintains the rejection given on the Office Action dated 10/20/05.

Claim Objections

6. Claim 1 is objected to because of the following informalities:

- Claim 1, 4th paragraph recites "... quantized, RMBR ...": punctuation error. Appropriate correction is required.

Claim Rejections - 35 USC § 101

7. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1 and 12 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

With respect to claim 1, the claim is rejected under 35 U.S.C. 101 because the invention, as claimed, appears to be directed to merely an abstract idea. The Examiner makes this assertion because the claim simply recites a method of accessing a multi-dimensional index structure comprising the steps of "associating with each node ... node; representing ... MBR; and compressing ... quantization" with no attempt to tie all of the methods steps together in order to carry out a final concluding method step. Since the claim presented by the applicant is simply a representation of an abstract idea, the claims are not covered by the statutory categories of patentable subject matter set forth in 35 U.S.C. 101. However, an abstract idea is categorized as one of three judicially created exceptions to patentable subject matter (the three exceptions are Laws of Nature, Natural Phenomena, and Abstract Ideas). The courts have concluded that in order to patent one of the three judicial exceptions to the statutory categories of invention the applicant must show that the claimed invention has a practical, real-world application that produces a useful, concrete, and tangible result (State Street, 149 F.3d at 1373-74, 47 USPQ2d at 1601-02). In order to overcome this rejection, it is required that the Applicant amend claim 1 such that claim 1 provides a final concluding step. This final step should tie together all previously recited method steps. Finally, the claimed invention as a whole must

set forth a practical application of the invention, which provides a useful, concrete, and tangible result. Correction of this deficiency is required.

With respect to claim 12, the claim is rejected under 35 U.S.C. 101 because the invention, as claimed, appears to be directed to merely an abstract idea. The Examiner makes this assertion because the claim simply recites a method of accessing a multi-dimensional index structure comprising the steps of "associating with each node ... node; representing ... shape; and compressing ... quantization" with no attempt to tie all of the methods steps together in order to carry out a final concluding method step. Since the claim presented by the applicant is simply a representation of an abstract idea, the claims are not covered by the statutory categories of patentable subject matter set forth in 35 U.S.C. 101. However, an abstract idea is categorized as one of three judicially created exceptions to patentable subject matter (the three exceptions are Laws of Nature, Natural Phenomena, and Abstract Ideas). The courts have concluded that in order to patent one of the three judicial exceptions to the statutory categories of invention the applicant must show that the claimed invention has a practical, real-world application that produces a useful, concrete, and tangible result (State Street, 149 F.3d at 1373-74, 47 USPQ2d at 1601-02). In order to overcome this rejection, it is required that the Applicant amend claim 1 such that claim 1 provides a final concluding step. This final step should tie together all previously recited method steps. Finally, the claimed invention as a whole must

set forth a practical application of the invention, which provides a useful, concrete, and tangible result. Correction of this deficiency is required.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

Claim 8 recites the limitation "the corresponding QRMBR" that is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 6-9, and 11 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,470,344 issued to Kothuri et al. ("Kothrui").

As to **Claim 1**, *Kothuri teaches* a method of accessing a multi-dimensional index structure resident in main memory for facilitating reference to data objects stored in a database, wherein the index structure consists of internal nodes

having pointers to child nodes and leaf nodes having to database objects, the method comprising:

- associating with each node *(Figures 1B, 4, 6B)* a minimum bounding rectangle ("MBR"), wherein each MBR is a minimal hyper-rectangle enclosing a corresponding data object in the case of a leaf node and all hyper-rectangles in the child node in the case of an internal node *(Figures 1A, 3 and 7 illustrate associating with each node a minimum bounding rectangle, column 9, lines 1-21)*;
- representing each of one or more said MBRs by a relative representation of an MBR ("RMBR") that is coordinates of the MBR represented relative to coordinates of a reference MBR *(Figures 3 and 6A display the relative representation of a minimum bounding rectangle, column 11, lines 47-53)*; and
- compressing *(column 11, line 66)* each RMBRs into a quantized, RMBR ("QRMBR") by quantizing each RMBR to a finite precision by cutting off trailing insignificant bits after quantization *(column 11, lines 60-67 and column 12, lines 1-62 wherein illustrates an equivalent process of cutting off trailing insignificant bits after quantization using truncate or rounded down procedure).*

As to **Claim 2**, *Kothuri teaches* wherein said multi-dimensional index structure is an R-tree *(Figure 4, illustrates the R-tree, column 12, lines 55-56).*

As to **Claim 6**, *Kothuri teaches* wherein each internal node has a plurality of entries and wherein a first entry has a QRMBR and a pointer while the rest of the entries have only QRMBRs *(column 12, lines 49-54)*.

As to **Claim 7**, *Kothuri teaches* wherein each node stores a reference MBR *(Figures 1A and 1B illustrate each node stores a reference MBR)*.

As to **Claim 8**, *Kothuri teaches* wherein the reference MBR of a node is obtained from the corresponding QRMBR stored in the node's parent node *(column 12, lines 49-54)*.

As to **Claim 9**, *Kothuri teaches* wherein the internal nodes store QRMBRs while the leaf nodes store MBRs *(column 9, lines 10-21)*.

As to **Claim 11**, *Kothuri teaches* wherein said database resides in disk *(column 6, lines 14-16)*.

Claims 12-14 and 16 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,470,344 issued to Kothuri et al. ("Kothrui").

As to **Claim 12**, *Kothuri teaches* a method of accessing a multi-dimensional index structure resident in main memory for facilitating reference to data objects stored in a database, wherein the index structure consists of internal nodes having pointers to child nodes and leaf nodes having to database objects, the method comprising:

- associating with each node a minimum bounding shape *(Figures 1A, 3 and 7 illustrate associating with each node a minimum bounding shape,*

column 9, lines 1-21), a multi-dimensional shape enclosing a corresponding data object in the case of a leaf node and all minimum bounding shapes in the child node in the case of an internal node *(Figure 1, column 8, lines 19-39)*;

- representing each of one or more said minimum bounding shapes by a relative representation that is coordinates of the minimum bounding shape represented relative to coordinates of a reference minimum bounding shape *(Figures 3 and 6A display the relative representation of a minimum bounding shape wherein the shape is equivalent to the illustrated rectangle, column 11, lines 47-53)*; and
- compressing each relative representation into a quantized representation by quantizing each relative representation to a finite precision by cutting off trailing insignificant bits after quantization *(column 11, lines 60-67 and column 12, lines 1-62 wherein illustrates an equivalent process of cutting off trailing insignificant bits after quantization using truncate or rounded down procedure)*.

As to **Claim 13**, *Kothuri teaches* wherein each internal node has a plurality of entries and wherein a first entry has a quantized representation and a pointer while the rest of the entries have only quantized representations *(column 12, lines 49-54)*.

As to **Claim 14**, *Kothuri teaches* wherein the reference minimum bounding shape of a node is obtained from a corresponding quantized representation stored in the node's parent node *(column 12, lines 49-54)*.

As to **Claim 16**, *Kothuri teaches* wherein said database resides in disk *(column 6, lines 14-16)*.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,470,344 issued to Kothuri et al. ("Kothrui") as applied to claim 1 above, and further in view of U.S. Patent No. 6,868,410 issued to Fortin et al. ("Fortin").

As to **Claim 3**:

Kothuri teaches the elements of Claim 1 as stated above.

Kothuri does not explicitly teach wherein said multi-dimensional index structure is an R*-tree.

Fortin teaches wherein said multi-dimensional index structure is an R*-tree *(column 8, lines 31-65)*.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the teaching of Fortin with the teaching of Kothuri in order to provide a method or system which integrates multi-dimensional index structure such as an R*-tree, thereby providing a method or system which further improved storage or memory utilization and robustness in processing data distribution.

As to **Claim 4**:

Kothuri teaches the elements of Claim 1 as stated above.

Kothuri does not explicitly teach wherein said multi-dimensional index structure is an R+-tree.

Fortin teaches wherein said multi-dimensional index structure is an R+-tree *(column 8, lines 31-65)*.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the teaching of Fortin with the teaching of Kothuri in order to provide a method or system which integrates multi-dimensional index structure such as an R+-tree, thereby providing a method or system which further reduced overlap of minimum bounding rectangles.

As to **Claim 5**:

Kothuri teaches the elements of Claim 1 as stated above.

Kothuri does not explicitly teach wherein said multi-dimensional index structure is a Hilbert R-tree.

Fortin teaches wherein said multi-dimensional index structure is a Hilbert R-tree (column 8, lines 31-65).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the teaching of Fortin with the teaching of Kothuri in order to provide a method or system which integrates multi-dimensional index structure such as a Hilbert R-tree, thereby providing a method or system which further improved storage or memory utilization.

Claims 10 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,470,344 issued to Kothuri et al. ("Kothrui")

as applied to claims 1 and 12 above respectively, and further in view of "Compacting Discriminator Information for Spatial Trees by Inga Sitzmann and Peter J. Stuckey, Copyright 2001, Australian Computer Society, Inc.

As to **Claims 10 and 15**:

Kothuri teaches the elements of Claims 1 and 12 as stated above respectively.

Kothuri does not explicitly teach wherein said database resides in main memory.

Sitzmann and Stuckey teach wherein said database resides in main memory *(Abstract, page 167)*.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the teachings of Sitzmann and Stuckey with the teaching of Kothuri in order to provide a method or system wherein database will fit entirely in main memory (Sitzmann and Stuckey, Introduction).

Citation of Pertinent Prior Art

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- Lee et al. (US Patent No. 7,072,891), "Apparatus and Method for Hyper-rectangle Based Multi-Dimensional Data Segmentation and Clustering".
- Deshpande et al. (US Patent No. 6,601,062), "Active Caching for Multi-Dimensional Data Sets in Relational Database Management System".

- Castelli et al. (US Patent No. 6,134,541), "Searching Multi-Dimensional Indexes Using Associated Clustering and Dimension Reduction Information".
- Baskins et al. (US Patent No. 6,671,694), "System for and Method of Cache-Efficient Digital Tree with Rich Pointers".
- Baskins et al. (US Patent No. 6,654,760), "System and Method of Providing a Cache-Efficient, Hybrid, Compressed Digital Tree with Wide Dynamic Ranges and Simple Interface Requiring No Configuration or Tuning".
- Oh et al. (Pub. No. US2004/0119611), "System and Method for Progressive Spatial Data Service".
- Beesley et al. (US Patent No. 6,252,605), "System and Method for Packing Spatial Data in an R-Tree".
- Kothuri et al. (US Patent No. 7,080,065), "Query Pruning Using Interior Rectangles in a R-Tree Index".

Response to Arguments

12. Applicant's arguments filed 09/06/2006 have been fully considered but they are not persuasive. Examiner respectfully maintains the rejection cited for the following reasons:

- Applicant argues: Applicant stated on the 5th paragraph of page 9 that "Kothuri does not disclose that they are relative coordinates calculated based on a coordinate of a reference MBR as claimed in claim 1 (similar claim 12) of the present application".

Examiner responds: In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., relative coordinates calculated based on a coordinate of a reference MBR) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

- Applicant argues: Applicant stated on the 3rd and 4th paragraphs of page 10 that "Kothuri does not disclose compressing each RMBR into a quantized RMBR (QRMBR) by cutting off trailing insignificant bits after quantization as claimed in claim 1 of the present application".

  Examiner responds: Examiner is not persuaded. Based on Applicant's disclosure in the Specification, page 7, lines 12-15, wherein Figure 1 illustrates the compression scheme, which is cutting off trailing insignificant bits. Thus, Kothuri in column 11, line 64 wherein truncate or round down feature used in the cited prior art is equivalent to cut off trailing insignificant bits that is similar to applicant's compressing scheme limitation.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh-Ha Dang whose telephone number is 571-272-4033. The examiner can normally be reached on Monday-Friday from 9:00 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Don Wong can be reached on 571-272-1834. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Thanh-Ha Dang
Examiner
Art Unit 2163

ALFORD KINDRED
PRIMARY EXAMINER